

# Botanical Notes on the Hen and Chickens Islands.

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## I. INTRODUCTION.

The Hen and Chickens Group consists of eight islands or islets off the East Coast of North Auckland, by far the biggest and most impressive being Taranga (the Hen), while the Chickens lie strung out in a chain about 6 km. to the north. Sighted and named by Captain Cook on the 29th November, 1769, the islands were, according to Mr. George Graham, in Maori occupation long before the Great Migration, being abandoned in 1821. Little authentic information about the legends or economics of the Maori owners is now available. Signs of occupation are seen in many long, straight, carefully built rock-wall wind-breaks, in piles of stones and boulders collected from land required for cultivation, and in fortifications on high ground.

The islands have been visited by many naturalists, the occurrence of several rare plants being recorded by Cheeseman, Kirk, and Hutton. The present is the first description of the plant-cover, based on two weeks' field work in the early summers of 1933 and 1934. The species list, though obviously incomplete in certain groups, should be of value in ascertaining floristic relations with the mainland, and with the other islands off the East Coast.

**1. Topography:** The islands are obviously remnants of the highland system persisting in the Whangarei Heads, Little and Great Barrier Islands, and the Coromandel Peninsula. All these are notable for great masses of volcanic rock weathered to form precipitous and sometimes overhanging strangely sculptured cliffs.

From the mainland the smaller islands appear rounded or conical, but Taranga is a tall blue mountain rising steeply from the sea. Gentler slopes above lead the eye to the three major peaks, which hide a median ridge sweeping to the north-east to form the backbone of the narrow island. At its extremity this dwindles to a knife edge 100-120 m. above the sea. Nearer the centre and to the north-west is a series of shallow valleys separated by rounded spurs, all truncated by high sea-cliffs. Elsewhere, both on the ridge and the summit pinnacles, the flanks are steep with numerous rock faces. These slopes become more concave at lower levels, and in a very few places occur almost flat areas of about 2 ha., behind boulder beaches. Though V-shaped

watercourses, filled with great rocks and flood debris, are numerous, running or other surface water is remarkably rare on the island. (1) The whole coastline is rough, short boulder beaches alternating with wave-cut platforms or fissured cliffs running into deep water. On the biggest Chicken is a crescentic sandy beach. Mud bottom is shown on the chart, in deeper water, but there is no muddy shore and therefore no mangrove or *Zostera*.

**2. Geology:** Taranga and the Chickens are of different geological origin. We thank Professor J. A. Bartrum, of Auckland University College, for permission to quote the following notes made on a brief visit in 1934. "The island (Taranga) consists of coarse volcanic fragmentals of andesitic nature—mainly breccia—penetrated by fairly common dykes of andesite, and containing occasionally what appear to be flows of the same material." Of the biggest Chicken he says, "It is of greywacke, interlaminated in places with hard blackish shale; quite a number of dykes, which appear to be of porphyrite—though I have not yet sectioned their rocks—appear here and there."

The remaining islets are similar in nature, often weathered above the spray-zone to dry plates or crumbling chips. (2).

**3. Climate:** No statistics are available, but the vegetation points to milder temperatures than those of the mainland opposite, where the mean is 16.2°C., with mean daily range of 8.6°. The poor showing of filmy ferns and bryophytes may be taken as an indicator of lower precipitation and humidity, the Waipu mainland figures being 100-125 cm. per annum. Winter is decidedly the rainy season. Wind seems to strike from all angles, but its effect is not marked except on sharp ridges and towards the tops of funnel-like valleys that run down to the sea on the colder southern coast. Elsewhere it is shot upwards by sheer cliffs, which thus protect the basins above from its direct force. Wind is important, too, as a carrier of spray, often preventing any but halophilous species from growing for a hundred metres or so up the cliff face. In closed communities penetration is slight, owing to density of canopy, especially where severely pruned.

**4. Animal Life:** Birds are very abundant; tuataras occasionally rustle over the dead leaves, and skinks abound both on boulder-beaches and under cover of trees and shrubs. Rats (numerous, and with a taste for bird-life) are the only mammals. No trampling or grazing animals have been deliberately introduced, but some years ago a few bullocks swam ashore from a scow in heavy weather off the biggest Chicken, causing much disturbance till their death. In the absence of such beasts broken bark, boughs or saplings are rarely seen.

(1) This is emphasised by the number of birds that flock to the few available pools. Three shallow squared pits, each about 4 m. by 3 m., constructed (possibly for water storage) on a flat part of the main ridge, contained a layer of some 20 cm. of water above a fine black accumulation of peaty matter. Here at one time a dozen or so birds of three species were seen bathing.

(2) *Soils:* Representative samples were taken on Taranga and on one of the Chickens, but the analyses are not yet available.

## II. PLANT-COVER OF TARANGA.

The vegetation falls into three major groups. The coastline communities, depending on the presence of salt water and spray, include sub-littoral and littoral algal associations, open and closed salt-meadows, the vegetation of cliffs and boulder beaches, and coastal scrub. The communities of interior rocks are often similar to those of the sea-cliffs, but are less affected by proximity to salt-laden air. Most of Taranga and portions of the Chickens are forested, though large areas no longer bear their primitive cover. Throughout we treat as fully as possible for Taranga (and for the four Chickens visited) not only the phanerogams and pteridophytes, but also the lower cryptogams, usually neglected in accounts of New Zealand vegetation.

## A. COMMUNITIES OF THE COASTLINE.

1. **Marine Algal Communities:** All belong to the open-coast formation and the flora, though rather richer than that of the greywacke of Waiheke and of the Noises Islands in the Hauraki Gulf, is much poorer than that of the Pcor Knights or the more sheltered Waipu coves. The absence of cordlike *Mesogloia-ceae* and tufted and foliose gigartinas in the littoral, and of *Lessonia variegata* in the sub-littoral, distinguishes them from others more typical of this northern coastline, the affinities in species content and zoning being with small portions of the mainland (a) opposite Bream Island on the Whangarei coastline, and (b) at Harriet King's on the eastern Coromandel coast.

The substratum is rocky throughout, occasionally with a cover of clean sand visible beyond the boulder-beaches, whose movement eliminates many species above low-tide mark. On stable rock, particularly where shaded or exposed to strong surf-action, certain species reach right up through the *Lichina pygmaea* belt. Where anchored boulders form a pavement they are capped at about low-tide mark by *Xiphophora chondrophylla* var. *minima*, followed by .5 m. to 1.5 m. tresses of *Carpophyllum phyllanthus*, *C. maschalocarpum* or *C. elongatum*, often as pure dominants, according to the degree of exposure of the coast itself. Slightly above *Xiphophora* on gentle slopes *Hormosira Banksii* is sometimes present, occasionally covering the whole surface of a low wave-cut platform with its buff fronds. Small pools in pitted conglomerate are lined with *Champia novae-zelandiae*, *Corallina officinalis*, *Microdictyon umbilicatum* and *Pterocladia capillacea*, the richness of representatives from the sub-littoral being augmented when the pools are fairly deep and shaded by the thalli of coarse brown species—often with *Xiphophora* again dominant on the margins.

Low tides revealed an abundance of the summer species. *Liagora Harveyana* in Old Woman's Cove, associated with a luxuriant growth of *Glossophora Harveyi*, *Carpophyllum maschalocarpum*, *Sargassum Sinclairii*, *Cystophora* spp., and *Ecklonia radiata* var. *Richardiana*, most of these running into deeper water where great buoyant plants were clearly visible against a sandy bottom for a depth of some metres. *Laurencia* was very abundant as an



epiphyte in the sub-littoral, but no sign was seen of *Lessonia variegata*, though it may have escaped our notice below the dense *Carpophyllum elongatum* belt on the northern coastline of Taranga.

High salinity is maintained owing to the small flow of fresh water, trickles of which on cliffs sometimes support a growth of *Enteromorpha intestinalis*. *Catenella opuntia* and various *Myxophyceae* tolerate these conditions at the same or a lower level. There is no brackish water flora, and the extreme richness of *Ralfsia sp.* towards the lower littoral possibly reflects this scarcity of fresh water. With the clear water, the many sunny days and long spells of poor surf, the effect of insolation is seen in (a) the paucity and dwarfing of species between the tide marks, (b) the masking of typical colours. *Carpophyllum*, *Cystophora*, *Hormosira*, *Sargassum* and *Xiphophora* are sometimes so stunted as to be almost unrecognisable. Blackening of apices is common, and killing by long exposure frequent. Species of *Melanthalia*, *Nemastoma* and *Pterocladia* become yellowish or olive, and *Catenella* a dull greenish purple, but all retain their bright colours when screened in any way.

A number of interesting new records were made amongst the smaller species, and some found here for the first time cannot yet be identified.

**2. Spray-zone Communities:** These differ little from those of long stretches of the North Auckland coastline. Lichens extend from the inconspicuous *Arthopyrenia sp.* (on *Mitella mitella*), *Verrucaria aucklandica*, *V. maura* and *Lichina pygmaea var. intermedia* of the lower limits to a 2 to 8 m. deep greyish-white belt of *Ochrolechia parella* and *Ramalina leiodea*, among which grow spp. of *Buellia*, *Caloplaca*, *Lecanora*, *Lecidea*, and *Cladonia aggregata*. There is in places on the cliffs a sombre cover, largely of *Caloplaca* and *Lecidea* spp., up to 50 m. in maximum exposure.

*Aira caryophyllea*,\* *Asplenium flaccidum*, *A. lucidum*, *Astelia Banksii*, *Coprosma retusa*, *Linum monogynum*, *Samolus repens*, *Salicornia australis*, *Senecio lautus*, *Trisetum antarcticum*, cling to salt-drenched pockets. Neither *Myoporum laetum* nor *Stipa teretifolia* occur on open rock as they do on the Chickens.

**3. Coastal Scrub:** This is common on cliffs and forms dense masses, tending to bind and encroach on boulder beaches. Beginning in the tight tangles of *Muehlenbeckia complexa* and *Coprosma retusa* on loose rocks, it rises to a height of about 3 m., often merging into wind-pruned forest behind. *Phormium tenax* is associated with a number of woody species of very twiggy habit, the whole interlaced with vines of *Muehlenbeckia*, *Calystegia* spp., or *Sicyos angulata*. The last-named, together with abundant *Hymenanthera novaezelandiae*, *Hebe Bollonsii*, *H. parviflora* and *Paratrophis opaca* at once distinguish this community from any comparable mainland one.



## B. COMMUNITIES OF THE INTERIOR ROCKS.

Everywhere surface rock is abundant; even in heavy forest, besides boulders on the floor, vertical rock faces are very frequent, either wholly or partly concealed by tall trees. In their shaded parts these are fairly densely covered by climbers and species, including most of the filmy ferns and many bryophytes, that are here confined to rock, though elsewhere usually epiphytic. Niches in the conglomerate are occupied by *Poa anceps* and *Anthropodium cirrhatum*. Where a little more foothold is available on small, sunny ledges or on tops of columns *Astelia Banksii* and *A. Solanderi* dominate, accompanied in places by *Xeronema Callistemon*, and often with *Dendrobium Cunninghamii* pendent from their exposed bases.

Shrubby species (*Edwardsia microphylla*, *Entelea arborescens*, *Hebe parviflora*, *Leptospermum ericoides* and *Solanum aviculare*) on wider ledges shade masses knee to thigh deep of *Microlaena polynoda*, *Poa anceps* and *Uncinia australis*, and often lush *Arthropodium*. Where dry rock-dust and fragments accumulate occur *Angelica rosaeifolia*, *Hymenanchera* and *Mesembryanthemum australe*. Sunny slopes at an angle of only 15° to 20°, where well sheltered from wind action, have extensive mats 10 to 15 cm. deep of *Oplismenus undulatifolius* with other herbaceous species, some exotic. The most exposed places have only occasional patches of moss or *Scleranthus biflorus* amongst lichens, but the tops of knobs and peaks carry a sturdier vegetation, often of two or more layers, dominated by *Metrosideros excelsa* 2 to 3 m. high, draped with bright wisps of *Teloschistes flavicans* and spreading thalli of *Sticta* spp. Frequent are *Coprosma* spp., *Leptospermum ericoides*, *Nothopanax arboreum*, *Suttonia australis*, *Senecia Kirkii*, *Griselinia lucida* and *Pittosporum umbellatum*—the last two confined to this habitat. Between, under, and usually girdling these are dense colonies of *Astelia Solanderi*.

On the more fiercely insolated aspects *Pomaderris phyllocaefolia* and *Haloragis depressa* hug the rock, separated by golden green carpets of *Triquetrella papillata*, *Leptodontium interruptum*, *Hypnum cupressiforme* and *Bryum truncorum*. Where fruticose and foliose lichens become dominant (notably *Cladonia aggregata*, *Sticta Mougeotiana*) *Polytrichum juniperinum*, *Tillaea Sieberiana*, *Cheilanthes Sieberi* and *Notochlaena distans* form dry brittle tufts. Lichens of varied life-form cover all rock not occupied by larger plants. Several of the encrusting species are white; grey-greens or greenish-yellows are contributed by species of *Cladonia*, *Parmelia*, *Stereocaulon*, *Sticta* and *Usnea*; brightest of all are the golden *Teloschistes* and splashes of *Xanthoria parietina* visible even from the sea.

## C. FOREST COMMUNITIES.

1. **Coastal Forest:** True coastal forest may reach to the very tide, and this, or semi-coastal forest, forms the greater part of the unmodified vegetation of the island. Pohutukawa (*Metrosideros excelsa*) forest is confined to the more rocky slopes and

ridges, but the species extends on rocks right to the summit. Elsewhere *Beilschmiedia tarairi* 6 to 12 m. high, is often a pure dominant forming a very uniform brownish-green canopy, as when filling a gently sloping valley. Or a score of species may be almost equally represented, presenting a rich mosaic of greens, broken here and there, especially near rocks, by tall spires of *Knightia excelsa*. Many of these species (e.g., *Cordyline australis*, *Entelea arborescens*, *Melicytus ramiflorus*, *Nothopanax arboreum*) would not reach the roof of a taller forest. The only important local dominants are *Dysoxylum spectabile* (over fairly wide areas), and *Meryta Sinclairii* or *Vitex lucens* in occasional groves with *Paratrophis opaca* and *Sideroxylon novo-zelandicum* co-dominant on windy ridges. Tree ferns are rare. *Rhipogonum scandens* and *Rubus australis* are the only important lianes, while epiphytes are negligible except where an occasional old *Vitex* carries *Astelia Solanderi* on partly dead branches.

The internal characteristics depend on (1) the rocky substratum, (2) the dryness of the ground, (3) the almost complete absence of disturbance by wind or animals, (4) the density of the canopy, and (5) the great size of individual leaves of the majority of the trees. Using Cockayne's (1928) criteria for size of leaves, an analysis of the 30 shrub and tree species occasional to abundant on Taranga in coastal forest shows the percentages: Very small 2.5, small 5, medium 25, large 35, very large 32.5. Of the dominants, *Beilschmiedia tarairi* is *medium* in bright sunlight and wind, and *large* to *very large* where shaded; *Dysoxylum spectabile* always *very large*; *Metrosideros excelsa* is the only really abundant species in which the leaves are never *very large* even in sheltered places. The result is a dimly lit interior where between the clean straight trunks few species of middle height maintain themselves. Saplings are slender, and though fairly numerous, are well spaced. *Corynocarpus laevigatus*, *Melicytus ramiflorus* and *Pisonia brunoniana* produce crowded erect shoots from their trunk bases. *Rhopalostylis sapida* is abundant either as large isolated specimens or in groves, where, short-trunked and uniform in size, the leaves of adjacent plants just meeting, it forms the chief undergrowth in forest of low stature. *Macropiper excelsum* occurs freely throughout, often with *Rhabdothamnus Solanderi*, especially amongst rocks. *Coprosma grandifolia* is frequent and *Urtica ferox* occasional by stream-beds.

Probably because of the unstable substratum the common floor-cover is of ferns, usually about 0.6 m. high, perched on boulders of all sizes. *Asplenium lamprophyllum* is usually dominant, with *Polystichum Richardi* very frequent, *Asplenium lucidum* frequent. Scattered under the palms and laxly branching shrubs, but closely packed where this intermediate layer is absent, the tufts of soft fronds often hide the ground for decametres at a time. Though seedlings (especially *Corynocarpus laevigatus*, *Beilschmiedia tarawa* and *B. tarairi*) 10 to 20 cm. high are in places very abundant, few occur where the fern-cover is dense, or, at the other extreme, where the floor is covered in a litter up to 15 cm. deep of harsh fallen, slowly decaying leaves, antagonistic to the

establishment of small plants of any kind. Filmy ferns and bryophytes are absent from the actual floor, though thin dark mosses (e.g., *Echinodium* spp., *Camptochaete pulvinata*, *Hypopterygium novae-zelandiae* var. *nudicaule*) cover fixed boulders between the trees, especially in the dry stream beds. Well shaded rock faces have a fair range of species, with *Leucobryum candidum* and *Rhyncostegium tenuifolium* dominant where dry, and *Eriopus Brownii* where moist. Epiphytic mosses are rare, almost invariably small and appressed to bark; *Dicranoloma Menziesii*, the most conspicuous, is confined to surface roots and trunk-bases.

**2. Leptospermum Communities:** Much of the island (fig. 2) bears pure stands of Kanuka (*L. ericoides*), its dense canopy smoothly following the contours of the shallow valleys along the northern side of the median ridge. These were the largest areas of gently sloping land available to the Maori. Elaborate fortifications on vantage points, and other stonework scattered throughout, indicate that this land was worked intensively, and except in a few cases, the extent of *Leptospermum* to-day is a measure of the interference with the primitive cover.

Over maturity is characteristic of big stretches, the senescent kanuka being remarkable for its great height, its large furrowed trunks (40 cm. diam.), its great proportion of standing dead wood, its unusual undergrowth of *Coprosma grandifolia*, and its burden of epiphytic *Astelia Solanderi*. This last, falling from or with the kanuka, establishes itself on the floor in great masses bound together by *Clematis parviflora*, and often bedded in pale cushions of *Leucobryum candidum*. The abundance of *Astelia* points to the efficiency of bird-dispersal in this genus and to the great age of the kanuka in which it has been able to establish so remarkably. The creeping *Polypodium diversifolium* on the dry soil is as abundant as is the tufted *Asplenium lamprophyllum* on the loose rocks of the coastal forest. These two ferns are practically confined to their respective communities, whereas *Asplenium lucidum* is more adaptable.

Regeneration of forest species occurs freely where odd trees or wedges of forest remain in damp or rocky hollows, but where this source of seed supply is distant a few species of rather low stature, principally *Coprosma* spp., form a large-leaved shrub-layer, conspicuous when a break occurs above. *Nothopanax arboreum* is less abundant than in the coastal forest, while *Phoridium tenax* and a little *Pteridium esculentum* grow where light is sufficient, the former rarely persisting long, though it may re-enter the community when the old kanuka begins to fall.‡

In a few small areas the growth of manuka (*L. scoparium*) rather than kanuka has recently been favoured by burning, frequent (shown by the different ages of the clumps) and irregular (shown by ragged junctions with surviving forest), rather different in its effects from the systematic clearing of the Maori.

‡Groves of *Cordyline australis* are a feature of the eastern gullies, most showing comparable signs of old age in much-branched hollow trunks arising from a litter of dead leaves.



Forest species regenerate more freely, and there are thickets of *Phormium tenax* or *Hebe* (2 spp.) with, in one western valley, an admixture of *Dactylis glomerata*. Where wanton firing has destroyed all the humus, dry crumbling rock is sparsely covered with stunted shrubs, or a growth of *Aira caryophylla*,\* *Dichelachne crinita*, *Gnaphalium* spp., *Oxalis* spp., *Polycarpon tetraphyllum*‡ and *Sporobolus capensis* Kunth.\*

**3. Kauri Forest once on Taranga?** Just as surely as one could reconstruct the existing forest communities from a study of the seedling and shrub layers of the kanuka, so can we infer that kauri (*Agathis australis*) once played an important part on the higher slopes, as it still does on the bigger Barrier Islands to the south. Three trees of different ages were seen, the largest (18 m. high and 50 cm. d.b.h.) sufficiently old to show that the species is not of recent introduction, and the other two young enough to show continued vigour in regeneration. With them, and scattered through the kanuka, are *Astelia Cunninghamii*, *A. trinerzia*, *Coprosma grandifolia*, *C. lucida*, *C. rhamnoides*, *Gahnia setifolia*, *Lepidosperma laterale*, *Leucopogon fasciculatum*, *Lygodium articulatum*, *Pterostylis Banksii* and an *Alseuosmia* indeterminable in the absence of flowers and fruit. Such an assemblage of kauri forest constituents, together with the fact that kauri is normally gregarious, provides our strongest evidence that these few trees are of great significance as survivors after burning, clearing, or even cutting for spars long ago (though this last is but a surmise). Waipu settlers who have known and visited Taranga during the last 70 years know nothing of such changes in this particular area, and had not heard of the presence of kauri until our discovery in December, 1934.

Though kauri forest is gone, these trees and their associates are plainly, we consider, a relic of a higher altitude vegetation, surviving the gradual sinking of the land mass, accompanied by the penetration of salt-tolerant species to the highest points, with the subsequent development of an almost purely maritime vegetation.

### III. VEGETATION OF THE CHICKENS.

Though the vegetation of these smaller islands is very similar to that of the lower slopes of Taranga, there are certain striking differences correlated with (a) **physical factors**: altitude lower (225 m. max.), contours rounded without interior bluffs, rock sedimentary (greywacke slipping in plates or small chips), soil usually compact, dry; (b) **biotic factors**: clearing more widespread (due to repeated burning), concentration of burrowing sea-birds very high, sometimes affecting a whole island.

Marine algae are poor except where heavy swell strikes continuously, but salt-meadow and coastal scrub are better represented, and are sometimes induced by bird activities.

In least modified parts *Metrosideros excelsa* is dominant, *Dysoxylum spectabile*, *Olea apetala*,‡ and *Meryta Sinclairii* are abund-

ant to locally dominant. On the whole, tree species are fewer. *Beilschmiedia* forest is absent (though odd trees of both species may have been missed). *Agathis australis* and *Xeronema Callistemon* do not occur, though a battered tussock of the latter, weighing about 15 kg., was found on the shore of the biggest island, probably sea-carried (like the *Durvillea* fronds) from the Poor Knights.

#### IV. INFLUENCE OF BIRDS.

1. **Fruit-eating birds:** Certain fruit-eating and nectar-sipping birds tear their food to pieces, so it is common to follow a whole foreshore without seeing seed of *Phormium*, and other fruits are eagerly sought. This may explain the small spread of coastal forest into the old kanuka, apart from *Astelias* and *Coprosmas*, the seed of which passes unharmed through the birds.

2. **Perching birds:** Though everywhere numerous, perching birds are on the whole not sufficiently concentrated to have any marked local effect. We noted, however, two cases of detrimental influence. On the smallest Chicken visited the death, apparently through suffocation, of a number of very fine specimens of *Meryta* may almost certainly be attributed to the roosting of starlings migrating from the mainland. The upturned leaves of other sickening trees and of most of the scrub below are plastered on both sides with offensive droppings. Whatever their relation to the dispersal of indigenous species, there is little doubt that they are responsible also for the incoming of *Phytolacca octandra*,\* an important member of the "bird-scrub" here.‡

The effect of shag colonies was especially noted at Old Woman Cove (Taranga). A pohutukawa living in 1933 was dead and whitened with droppings a year later. Beneath it only nitrophilous species thrive, e.g., *Coprosma retusa*, *Hymenanthera novae-zelandiae*, *Parietaria debilis*, *Solanum aviculare* on the cliffs, with yellow sheets of *Xanthoria parietina* on flat slabs on the wave-cut platforms below.

3. **Burrowing sea-birds:** The combined activities of blue penguins and petrels, of the latter Falla (1934) lists 5 spp. on Taranga and 7 on the Chickens, last over many months. Thousands hurtle in after dark, trampling down low plants until the ground is bare about the mouths of their burrows. They tunnel in hard or soft soil and vegetable debris (often under *astelias*), or amongst tree-roots and boulders, and up to 2 m. into the ground. This breaks up and aerates whatever soil is available, besides enriching it with excreta and nesting material. Everywhere an ephemeral growth of tall weak *Parietaria debilis*, *Stellaria parviflora* and *Solanum nigrum* springs rapidly into prominence as soon as nesting is over.

‡Male flowers, hitherto undescribed, were found here and on Taranga. The inflorescence is fugacious, bearing small, delicate leaves and two or three pairs of simple flowers. The only open flower found had three sepals and two large-anthered stamens, one abnormally lobed.

The maximum effect is seen on some of the smaller islands, where steep greywacke slopes are so riddled with burrows, and the rock fragments so loose, even when found by a tangle of *Muehlenbeckia*, that no tall growth can remain anchored, and even tussocks of *Agropyron multiflorum* and *Stipa teretifolia* eventually fall with their own weight. Vegetation that receives drainage from these slopes is remarkably rank, *Dichondra repens*, *Mesembryanthemum australe*, *Salicornia australis* and *Senecio lautus*, all rather plastic species, being especially luxuriant. Several such islets (e.g., D of list) are capped by a growth of coastal scrub species (*Hymenanthera novaeseelandiae*, *Coprosma retusa*), with scattered trees or groves of *Meryta Sinclairii*, *Pittosporum crassifolium* and *Sideroxylon novozelandicum*. The soil is a softly compacted brown mass of recognisable leaf remains, through which one's feet sink 20 to 30 cm. into the labyrinths of the burrows. It is generally bare except for *Corynocarpus* seedlings and an occasional tussock of *Asplenium lucidum* or the *A. flaccidum* epharmane that is so much more abundant under similar conditions on some of the Noises Islands. Over-disturbance of the roots or manuring far beyond the optimum may account for the remarkably small leaves of *Coprosma retusa* where steep slope merges into flat top.

## V. LEAF BEHAVIOUR.

*Macropiper excelsum* and *Myoporum laetum* have already given rise to much speculation as to the significance of leaves of great dimensions and thick texture on several coastal islands, but on Taranga, even under the forest conditions that affect other species strongly, *Macropiper* does not behave abnormally. Leaf dimensions averaged out at 6.4 by 8.4 cm., as compared with 13.75 by 13.75 cm. for leaves on the southern island of the Poor Knights. The large-leaved, coarse-textured form was found only on one small Chicken with a cover of bird-burrows and manured soil, which, from its warmth and richness must face the growth of the few species that can tolerate these conditions.

*Myoporum* shows diversity not only in leaf size and texture, but also in the tothing of the margins and in the stature of the plant. Taranga specimens differ little from mainland ones, but on greywacke ledges on two of the smaller islands, caught by spray and dwarfed by wind and probably washed by seepage from bird colonies around, the plants are low and sprawling, with large leaves, the succulence of which obscures the oil-glands.

In both these instances we see a fairly definite correlation with environment. A measure of this can be obtained only by controlled transplant experiments, preferably in two directions and especially from the mainland to the islands. Certainly the few plants we have seen grow in gardens retain their vigour, but may not this be a result of the care bestowed by keen horticulturists on rare and attractive forms?

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‡c.f. The very similar conical Maria Island of the Noises Group. There also a few tall trees have been killed, while just above the deep spray-zone is a fearsome thicket of *Lycium horridum*!\*



*Rhabdothamnus Solanderi*, though not obviously affected by birds, is also remarkable for size of leaf (up to 9.5 by 8 cm. in shade as compared with " $\frac{1}{2}$ -1 in. long, but sometimes over 2 ins." of Cheeseman's Manual (1925). From the series of specimens obtained (in forest) on Taranga and (in manuka scrub) on one of the Chickens we rank this also as probably a case of epharmony, the effective factors being very favourable soil, combined with exceptional stillness of air, dim lighting and mild temperatures. The same phenomenon is exhibited though in a lesser degree by many species, notably *Corynocarpus laevigatus*, *Melicytus ramiflorus*, *Rhipogonum scandens* and *Suttonia australis*, all of which have greater average leaf area than on the mainland.

A large-leaved form of *Beilschmiedia tarva* presents rather a different problem. Though habitat conditions affect it considerably, as instanced by range of leaf-size on a single tree (5 by 2 cm. in sun and 15 by 6.5 cm. in shade), a comparative study of the species on the mainland and on a number of islands off the Auckland East coast has led us to suspect that some genetical difference is involved. Field observations on Taranga giving considerable support to this view will be detailed later.

## VI. FLORISTIC RELATIONS.

Though the relatively small number of species of phanerogams and pteridophytes (263, cf. 630 for North Auckland Botanical District) is a natural result of the limited range of habitats available, many important constituents of comparable adjacent mainland communities are absent. Striking examples are (a) genera: *Acaena*, *Aristotelia*, *Carpodetus*, *Cyathodes*, *Dracophyllum*, *Elaeocarpus*, *Freycinetia*, *Gaultheria*, *Nothofagus*, *Phebalium*, *Tmesipteris*, *Weinmannia*, and all conifers except *Agathis*; (b) species: *Lycopodium volubile*, *L. densum*, *Metrosideras robusta*, *Pseudopanax crassifolium*.

Lat. 36° S., which falls just south of the group, is the southern boundary of the North Auckland Botanical District (Cockayne, 1928). The Barrier Islands to the south-east are included in the Thames Sub-district of the South Auckland Botanical District. Though affinity with the vegetation of the former rather than of the latter district is shown in the dominance of *Beilschmiedia tarairi* over *B. tarva* in dicotylous forest, the characteristic features are on the whole, as might be expected, those common to the coastal strip of both Cape Colville and the east coast of North Auckland. The only northern local endemics are *Meryta Sinclairii*, *Hebe Bollonsii*, *Olea apetala* and *Xeronema Callistemon*. Of these the first is otherwise confined to the Three Kings, a separate district, in which it forms an important part of the vegetation; the second is common to all adjacent islands, while the third links with Whangarei Heads, and the fourth only with the Poor Knights (which show interesting floristic differences in the presence of *Suttonia divaricata*? (large-leaved form), *Carmichaelia Williamsii*, *Blechnum norfolkianum*, and *Danthonia bromoides*. The Hen and Chickens may, then, reasonably be retained in the North Auckland Botanical District to which they were tentatively referred by Cockayne.

## VII. LIST OF SPECIES.

Unless authorities are given these are: for Algae as in Laing's (1926, 1930) lists; for Musci, as in Dixon's (1913-1929) Bulletin; for the rest as in Cheeseman's (1925) Manual, except that *Hebe* is used instead of *Veronica*.

Fungi were few, apart from dry *Hirneola polytricha*, but winter collecting should be richer. *Aseroc rubra* was seen, the others collected have not yet been worked up.

The lichens have in part been identified by Hofrat Dr. A. Zahlbruckner, who has generously worked over large collections sent him by Dr. H. H. Allan, in part after critical comparison with other specimens named by him. A number of species still await examination, but the list is sufficient to give a good idea of the lichen florula, and to serve as a basis for further ecological work. A set of specimens is being deposited in the Auckland Memorial Museum.

Liverworts were collected, but have not been listed, as no comprehensive modern revision of the group is available. In most cases only provisional names could be given, and unless accompanied by detailed descriptions or sketches, would be of little value. Species are probably fewer than those of mosses. Most are small, foliose and appressed to the substratum, which is occasionally bark, but most often rock, where, in dampest places *Radula* is the most important genus. Thallose types are represented only by very small quantities of *Aneura* (in a wide sense) and frondose ones by one small species on rough, vertical, sunny faces. Large forms like *Schistochila*, often abundant in kauri forest, are absent. *Lepidoziae* are rare and small (collected only on *Astelia* bases). *Trichocolea australis* with stems barely 1 cm. long is indicative also of a dry habitat.

## ACKNOWLEDGMENTS.

We gladly offer our thanks to Miss K. Pickmere, of Whangarei, for her company on our second visit and for the use of her dinghy. Assistance was also given by Mr. R. M. Laing and Mr. G. O. K. Sainsbury in checking the identification of certain seaweeds and mosses, by Mr. George Graham in seeking out information about the Maori occupation. Dr. H. H. Allan has kindly seen this paper through the press during our absence from New Zealand.

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*Abbreviations:* T, Taranga; A, B, C, D, the islands marked in fig. 1; R, rock; S, scrub; E, epiphytic; P, pools; d, dominant; a, abundant; f, frequent; l, local; o, occasional; r, rare; +, occurs; v, very.

## ALGAE.

1 = upper littoral, 2 = mid littoral, 3 = lower littoral, 4 = sublittoral,  
 † = important records.

CHLOPOPHYCEAE: *Bryopsis plumosa* 2 P o, 3 o. *Caulerpa Brownii* 4 + (dredged at 8 fathoms on A). *Codium adhaerens* 3 r (shaded by *Xiphophora*). *Cladophora prolifera*? 2 P o, 3 P a, 4 + (short harsh branches). *Chaetomorpha aerea* 1 P a, 2 P a, 3 + (spray-zone also). *Rhizoclonium Hookeri* (spray-zone on T, C). *Ulva rigida* 2 +, 3 +. *Enteromorpha intestinalis* 1 o-a, 2 o-a, 3 o. *Microdictyon umbilicatum* (Velley) zanard †, 2 P o (shaded by *Zonaria*).

PHAEOPHYCEAE: *Ectocarpus* n. sp.?, 2 E o, 3 E a, 4 E o (on *Xiphophora* mainly). *Colponemia sinuosa* 2 O f, 3 E o (small specimens). *Scytothamnus australis* 1 r, 2 o (very stunted). *Leathesia difformis* 2 +, 3 o, 4 +. *Splachnidium rugosum* 2 +, 3 r (very stunted). *Perithalia capillaris* (drift only). *Ecklonia radiata* var. *Richardiana* 1 P o, 2 P f, 3 a, 4 a-d. *D'Urvillea antarctica* (drift from living plants: Poor Knights—new record). *Hormosira Banksii* 1 P o, 2 va-d, 3 o-a (mudless-shore form; no parasitic *Notheia*!). *Xiphophora chondrophylla* 1 P r, 2 P o-f, 3 f-d (forms distinct belt). *Cystophora retroflexa* 3 P f, 4 a. *C. torulosa* 2 P o, 3 p f, 4 a. *Carpophyllum elongatum* 2 P o, 3 d (forms distinct belt in rough water). *C. maschalocarpum* 1 P r, 2 P o, 3 a-d, 4 o-a (forms distinct belt). *C. phyllanthus* 1 P r, 2 P o, 3 o-a, 4 va. *C. plumosum* 1 P +, 2 P o, 3 a, 4 va. *Sargassum Sinclairii* 2 P o, 3 P a, 4 a. *Zonaria Sinclairii* 2 P o, 3 P a, 4 a. *Taonia australasica* (Kuetz.) J. Ag. †, 3 r, 4 o (recorded previously from Kermadecs and Little Barrier. Collected by L.M.C. at Whangarei Heads and Harriet Kings, 1931). *Dictyota dichotoma* 3 r, 4 o. *Glossophora Harveyi* 2 P o, 3 P f, 4 a (conspicuous even growth; flat sexual form associated?). *Ralfsia* sp. †, 2 o, 3 o-d, 4 f (often wide belt below *Apophlaea*).

RHODOPHYCEAE: *Bangia fusco-purpurea* 1 +. *Porphyra columbina* 1 + (no continuous belt). *P. subtumens* †, 3 E o, 4 E o (on *C. maschalocarpum*, new host). *Nemalion* sp. 2 f, 3 f (short, sterile). *Liagora Harveyana* Zeh. †, 3 ld, 4 f (whitish tufts on boulders; collected also at Crusoe, Motuihi and Noises Islands, L.M.C.). *Pseudo-scinaia australis*? †, 2 P a, 3 P a, 4 + (C only; drift on T). *Caulacanthu's spinellus* 1 r, 2 +. *Gelidium caulacanthemum* 2 o, 3 o. *Pterocladia capillacea* 2 P o, 3 P a, 4 +. *P. lucida* 2 P +, 3 P r, 4 o. *Catenella opuntia* 1 o-a (ld. in spray-zone). *Melanthalia abscissa* 2 P o, 3 P a, 4 o. *Apophlaea Sinclairii* 1 r-f, 2 o-d, 3 o (forms wide belt). *Rhodymenia leptophylla* 3 P o. *Champia novae-zelandiae* 2 P o, 3 P f, 4 o. *Plocamium brachiocarpum* 3 P r, 4 o. *Abroeteia sub-orbicularis* 2 E o, 3 E a, 4 E a (on *Carpophyllum* spp.). *Caloglossa Leprieuri* 1 vr. *Acrosorium decumbens* 3 P o, 4 o. *Laurencia distichophylla* 3 E o, 4 E a. *L. pinnatifida* 3 P +. *L. virgata* †, 2 P o, 3 o-f. *Polysiphonia* sp. 2 P +, 3 P +. *Aphanocladia delicatula* †, 3 P o. *Dipterosiphonia heteroclada* 2 +, 3 + (on *Xiphophora*). *Bostrychia Harveyi* (freshwater, A). *B. mixta* 1 o-f. *Euzoniella incisa* 3 E a, 4 E o. *Vidalia Colensoi* 2 P r, 3 o, 4 o. *Griffithsia antarctica* 2 P a, 3 P o. *Ceramium clavulatum* 1 P a-d, 2 P a. *Ceramium* spp. 2 +, 3 +, 4 +. *Grateloupia* sp. 2 P r, 3 P o. *Nemastoma (Catenella) oligarthra* (J. Ag.) Kylin †, 2 o-d (forms narrow belt: recorded from Bay of Islands and Harriet Kings by Kylin; collected since on Poor Knights and at Whangarei Heads by L.M.C.). *Melobesia leptura* Fosl. 3 E +, 4 E +. *Melobesia* spp. 1 P o, 2 P a, 3 a, 4 a. *Lithophyllum (Derमतolithon) Carpophylli* 3 E +, 4 E +. *Lithothamnion* spp. 3 +, 4 +. *Amphiroa elegans* Harv., 2 P o, 3 P a. *Corallina Currieri* 2 a, 3 a. *C. officinalis* 1 P f, 2 a-d, 3 a-d (associated with *Hormosira*). *C. (Jania) micrathrodia* 2 P o, 3 f. *Hildenbrandia rivularis* † (fresh-water stream). *H. Crouani* J. Ag. 1 r-f, 2 o-d, 3 o-d, 4 a (identified by H. Skuja).

Families 28, genera 61, species 78.

## LICHENES.

cr = coastal rocks, r = rocks in general, b = bark of shrubs and trees,  
 or on twigs.

*Verrucaria aucklandica* cr, *V. maura* cr. *Arthopyrenia* sp. cr. *Microthelia magnifica* b. *Pyrenula nitida* b, *P. subpunctella* b. *Graphis tenella* b. *Thelotrema periphysatum* b. *Lichina pygmaea* var. *intermedia* cr. *Collema leucocarpum* b,



*C. vespertilio* b. *Leptogium aucklandicum* b, *L. chloromelum* b. *Heppia spectabilis* r. *Pannaria rubiginosa* var. *lanuginosa* b. *Psoroma sphinctrinum* b. *Lobaria verrucosa* b. *Sticta aurata* b, *S. carpoloma* b, r, *S. cellulifera* b, *S. coronata* b, *S. dissimilis* r (in forest), *S. filix* b, *S. fragillima* on moss, *S. fuliginosa* r, *S. impressa* b, *S. latifrons* b, *S. Mougeotiana* r, b, *S. subcaperata* b. *Peltigera dolichorhiza* on moss. *Bacidia viridis* b. *Lecidea albopractexta* b, *L. albocoerulescens* cr, *L. aucklandica* b, *L. circumdiluens* r. *Cladonia aggregata* r, etc., *C. capitellata* f. *degenerata* r, *C. Floerkana* on dead wood, *C. pycnoclada* r, etc. *Stereocaulon denudatum* r, *S. ramulosum* r. *Pertusaria aucklandica* cr. *Lecanora atra* f. *americana* b, *L. atrynca* var. *melacarpa* cr, *L. dispersa* cr, *L. ferrugosa* r, *L. subfusca* b. *Ochrolechia parella* cr. *Myxodictyon chrysostictum* b. *Parmelia cetrata* f. *sorediifera* r, b, *P. constrictans* r. *P. molliuscula* cr, *P. proluxa* cr, *P. saxatilis* var. *Aitoni* r, *P. subphysodes* b, r, *P. tenuirimis* var. *erimis* r, *P. trichotera* var. *typica* b, *P. pertusa* b. *Ramalina leiodea* r, *R. linearis* b, r. *Usnea arida* b, *U. florida* b, *U. rubescens* b, r. *Caloplaca acheila* f. *rubentior* cr, *C. Allanii* cr, *C. elegans* var. *tenuis* r, *C. pyracea* cr. *Telochistes chrysophthalmus* b, *T. flavicans* f. *glaber* b, r. *Xanthoria parietina* r, *Buellia canescens* cr, *B. Cranwelliae* cr, *B. myriocarpa* b, *B. stellulata* cr, *B. subdisciformis* var. *meiospora* r. *Rinodina exigua* r. *Anaptychia leucomelaena* var. *angustifolia* b, r. *Physcia stellaris* b.

Families 20, genera 33, species 79.

#### MUSCI.

1 = coastal rocks and scrub, 2 = interior exposed rocks, 3 = climax coastal forest, 4 = modified areas.

*Dicranoloma Menziesii* 2 o, 3 R E f. *D. Billardieri* 4, r. *Ceratodon purpureus* 2 vr. *Holomitrium perichaetiale* 2 R E r. *Dicnemoloma Sieberianum* 2 o, 3 R r. *Campylopus introflexus* 2 f, 4 r. *Leucobryum candidum* 2 o, 3 R o, 4 f. *Fissidens leptocladus* 4 R r (wet places). *F. anisophyllus* 1 + (flat, damp rock). *Weisia viridula* var. *gymnostoma* 1 a?, 2 a? (mostly sterile, may be some *Hymenostomum patulum*). *Barbula australasiae* 1 + (shaded rock). *Triquetrella papillata* 2 a. *Leptodontium interruptum* 2 a. *Tortella rubripes* 1 + (noted on A, C). *T. calycina* 2 o. *T. princeps* 1 + (on C). *Ptychomitrium australe*, 1 o, 2 o (shaded rocks down to spray zone. Previous N.Z. records—Mt. Torlesse, R. Brown; Tauranga, Berggren; Cape Colville, L.B.M. The last, like the Taranga one, a small form). *Grimmia pulvinata* var. *obtusata* 1 o. *Macromitrium* sp. (*prorepens* group 2 E +. *M. nov. sp.*? 1 o (as from similar habitat at Stony Bay, Cape Colville (L.B.M.) and Spirits' Bay (I. H. Millener). "I should think quite distinct from any N.Z. sp. and quite possibly new; but in absence of fruit must be left for present unnamed." H. N. Dixon). *Funaria hygrometrica* 4 +. *Bryum argenteum* 2 r. *B. dichotomum* 2 r. *B. truncorum* 1 o, 2 v a, 3 R +, 4 a. *B. campylotheicum* 1 + (on C). A sterile, unidentifiable bryoid 1 f. *Leptostomum macrocarpum* 2 o, 3 E r. *Philonotis tenuis* 4 + (on T, damp rock and small slip). *Polytrichum juniperinum* 2 a. *P. commune* 2 r. *Cryphaea dilatata* 3 E + (on T). *Cyrtopus setosus* 4 E o. *Echinodium umbrosum* 3 R a. *E. hispidum* 3 R a. *Ptychomnion aciculare* 3 E o, 4 1 f. *Trachyloma planifolius* 3 R o. *Weymouthia cochlearifolia* 3 E +, 4 E o. *W. mollis* 2 E o. *Papillaria crocea* 2 E r. *Orthorrhynchium elegans* 4 E r. *Homalia falcifolia* 3 R r. *H. pulchella* 3 R f E +. *Thamnum pandum* 3 R o. *Camptochaete pulvinata* 3 R E a. *C. arbuscula* 3 R o. *C. ramulosa* 3 E +. *C. angustata* 4 E +. *Eriopus Brownii* 2 +, 3 R f. *Pterygophyllum dentatum* 3 R r. *Cyathophorum bulbosum* 2 o, 3 R E 1 a, 4 o. *Hypopterygium novae-seelandiae* var. *nudicaule* 3 R f. *Rhacopilum strumiferum* 3 R E f, 4 o. *Pseudoleskea imbricata* 4 R + (first record north of Mahia Peninsula, where it grows on edge of sea beach). *Thuidium furfuriosum* 2 o-a, 3 E o, 4 o. *Acanthocladium extenuatum* E o. *Raphidostegium amoenum* 3 E f. *R. homomallum* 1 1 a, 3 E o (only near sea). *Brachythecium albicans* 1 + (has been considered as introduced, e.g., at Palmerston North. Also collected at Tasman Glacier). *Eurhynchium muriculatum*, *Rhyncostegium tenuifolium* 2 o, 3 R a, 4 o. *Plagiothecium novae-seelandiae* 3 R + ("All I have from N.Z. are submontane," G.O.K.S.). *Catagonium politum* 3 R o. *Hypnum cupressiforme* Linn., 2 a, 3 o. *H. chrysogaster* C M, 3 E o.

Families 24, genera 47, species 65.

Epiphytes 23 spp.; 14 exclusively epiphytic, 9 also on rock or ground.

Rupestrial 46 spp.; 33 exclusively rupestrial, 13 also epiphytes or terrestrial.

Terrestrial 10 spp.; 2 exclusively terrestrial.

## PTERIDOPHYTA AND SPERMATOPHYTA.

1 = coastal rock and scrub, 2 = exposed interior rocks, 3 = climax coastal forest, 4 = *Leptospermum* forest, \* = introduced.

*Hymenophyllum rarum* 3 r (on *Astelia* leaf-bases). *H. sanguinolentum* 3 R n, 4 R r. *H. dilatatum* 3 R r. *H. demissum* 3 r. *H. flabellatum* 2 r. *H. tunbridgense* 3 R r. *Trichomanes reniforme* 3 R o, 4 R o. *T. humile* 3 R 1 a. *Dicksonia squarrosa* 3 r. *Cyathea dealbata* 3 o, 4 o. *C. medullaris* 3 o. *Polystichum Richardi* 1 f, 2 o, 3 f-a, 4 o. *Dryopteris glabella* 3 +. *D. velutina* 31 f. *D. punctata* 3 +. *D. pennigera* 3 o. *Arthropteris tenella* 3 R o (also ascending trunks). *Asplenium adiantoides* 2 o, 4 o. *A. lucidum* 1 R a S o, 2 o, 3 f, 41 f (stouter above sea). *A. bulbiferum* 3 r. *A. flaccidum* 1 R o, 2 +, 3 R + E o. *A. lamprophyllum* Christ. 31 d, 4 v o. *Blechnum lanceolatum*. *B. capense* 1 S r, 4 v r. *B. filiforme* 3 R o, 4 R o. *B. membranaceum* 4 +. *Doodia media* 1 S o, 4 a. *Pellaea rotundifolia* 1 R o, 2 f. *Notholaena distans* 2 o. *Cheilanthes Sieberi* 1 R o, 2 f. *Hypolepis tenuifolia* 4 r. *Adiantum diaphanum* 3 o. *A. hispidulum* 2 o, 3 o. *A. affine* 3 r. *Pteris tremula* 4 r. *P. comans* 1 S 1 a, 3 1 f, 4 r. *P. macilenta* 3 o, 4 r. *Histiopteris incisa* 4 vr. *Pteridium esculentum* (Forst. f.) Ckn. 1 S 1 a, 4 o. *Paesia scaberula* 4 vr. (on slip with *Typha*). *Polypodium dictyopteris* 3 R o. *P. pustulatum* 3 R f. *P. diversifolium* 1 S o, 2 a, 3 R r, 4 a. *Cyclophorus serpens* 1 R a, 2 a, 3 E o, 4 R o. *Lygodium articulatum* 4 r. *L. Billardieri* 2 o, 3 E o. *Agathis australis* 4 r (3 trees seen).

*Typha angustifolia* 4 vr. (on wet slip a few metres long). *Paspalum scrobiculatum* 1 1 (on C). *P. distichum* 1 1 a (on D, very luxuriant form). *P. dilatatum*\* 4 + (on C). *Oplismenus undulatifolius* 2 1 d, 3 vr, 4 o. *Microlaena avenacea* 3 vr. *M. polynoda* 2 1 a, 4 1. *Phalaris canariensis*\* 1 + (on A). *Anthoxanthum odoratum*\* 1 +, 4 +. *Stipa teretifolia* 1 R 1 d (on A, C, tolerates high bird concentration). *Echinopogon ovatus* 2 1 a. *Sporobolus capensis*\* Kunth. 1 R r. *Deyeuxia Forsteri* 1 R f. *D. Billardieri* 1 R f, 4 o. *Dichelachne crinita* 2 a, 4 R f. *Holcus lanatus*\* 4 r (on A, C). *Aira Caryophylla*\* 1 R a-d, 2 a-d. *Trisetum antarcticum* 1 R r-a. *Danthonia semianularis* 2 r-o, 4 o-a (a very robust form). *Arundo conspicua* 1 R r, S o, 4 1 f. *Briza minor*\* 4 +. *Dactylis glomerata*\* 4 1 a. *Poa anceps* 1 R f S f, 2 f, 3 +, 4 o-f. *Festuca Myuros*\* 1 R o, 2 a, 4 a. *P. bromoides*\* 1 R o, 2 o, 4 f. *Bromus arenarius* 1 R 1 a. *B. Gussoni*\* Parl. 1 R o, 2 1. *Agropyron multiflorum* 1 R 1 a. *Pholiurus incurvatus*\* (L.) Hitchc. 1 R + (on A). *Mariscus ustulatus* 1 R 1, 4 r. *Scirpus cernuus* 1 R a. *S. nodosus* 1 R f. *Schoenus tendo* 4 + (T, seen in one locality). *Lepidosperma laterale* 4 + (T, seen in one locality). *Gahnia setifolia* 4 1 a. *G. lacera* 2 r, 4 1 a. *Ucinia australis* 4 +. *U. riparia* 4 +. *Carex virgata* (on C). *Leptocarpus simplex* 1 r (on A). *Rhopalostylis sapida* 3 1 a, 4 r. *Juncus polyanthemus*. *Rhipogonum scandens* 3 1 a, 4 +. *Cordyline Banksii* 4 o. *C. australis* 1 S r, 3 o, 4 1 d. *Astelia Cunninghamii* 2 f, 4 + (rarely, if ever, epiphytic). *A. Banksii* 4 o. *A. trinervia* 4 +. *A. Solanderi* 1 R S o-f, 2 f-a, 3 E o, 4 va. *A. nana* Carse 2 r (female collected, in flower). *A. nervosa* 4 +. *Xeronema Callistemon* W. R. Oliv. 2 1 a (T, confined to walls of one valley). *Dianella intermedia* 2 o, 3 R o, 4 o. *Phormium tenax* 2 f, 4 o-f. *Arthropodium cirrhatum* 1 a, 2 a, 3 R o, 4 1. *Libertia ixioides*. *Dendrobium Cunninghamii* 2 E o. *Bulbophyllum pygmaeum* 4 E + (on A). *Earina mucronata* 2 o, 4 E o. *E. autumnalis* 2 r. *Sarcophilus adversus* 2 r, 3 E r. *Thelymitra longifolia* var. *alba* 1 o, 2 o, 3 R r. *Microtis unifolia* 1 S o, 2 o, 4 o. *Pterostylis Banksii* 3 R +, 4 +. *P. trullifolia* 2 +, 3 R +, 4 +. *Acianthus Sinclairii* 4 1 a.

*Salix babylonica*\* 4 + (on A). *Macropiper excelsum* 1 S a, 2 o, 3 a, 4 o (nearest to "var. major" where burrowing birds most abundant). *Peperomia Urvilleana* 2 o, 3 R o, 4 o. *Paratrophis microphylla* 4 r. *P. opaca* 1 S a, 3 1 a, 4 r (seedling and reversion shoots with deeply lobed leaves). *Urtica ferox* 4 R o. *Parietaria debilis* 1 S a, 2 1 a, 4 o. *Australina pusilla* 3 1 a. *Knighia excelsa* 3 f, 4 o-f. *Rumex crispus*\* 1 s + (on A). *Muehlenbeckia complexa* 1 1 a, 2 1 a. *Rhagodia nutans* 1 1 a. *Salicornia australis* 1 o-la. *Pisonia brunoniana* 3 1 f. *Mesembryanthemum australe* 1 R o, 2 r. *Tetragonia trigyna* 1 o. *Phytolacca octandra*\* (on D). *Spergularia media* 1 o. *Polycarpon tetraphyllum*\* 1 a, 2 a. *Stellaria parviflora* 1 o, 3 o. *Cerastium viscosum*\* 2 o. *Silene gallica*\* 4 +. *Scleranthus biflorus* 1 o, 2 1 a, 4 o. *Clematis indivisa* 1 S o, 4 a. *C. parviflora* var. 1 S o, 3 o, 4 a. *Ranunculus hirtus* 3 o. *Hedycarya arborea* 3 o, 4 o. *Laurelia novae-zelandiae* 3 + (one big tree in stream bed). *Beilschmiedia tarairi* 3 a-d, 4 o. *B. taxa* 3 o-f, 4 o. *Litsaea calicaris* 3 vr (on B, one tree). *Nasturtium*

*stylosum* (dry shaded slopes). *Cardamine heterophylla* 3 o. *Lepidium oleraceum* 1 l. *L. ruderale*\* 1 +. *Brassica oleracea*\* 1 f. *B. campestris*\*. *Tillaea Siberiana* 1 a, 2 a. *Pittosporum crassifolium* 1 S o-f, 3 o-f (at low levels). *P. umbellatum* 2 o. *P. cornifolium* 3 o. *Rubus australis* 3 a, 4 o. *Carmichaelia australis* 1 S o-f, 3 r, 4 o. *Edwardsia microphylla* 1 o, 2 a, 3 R 1 f, 4 o (prostrate on loose slopes of D). *Geranium molle*\*. *G. pilosum* 2 o. *G. dissectum* 2 o, 4 +. *Pelargonium inodorum* 2 o, 4 f. *Oxalis corniculata* 1 o, 4 f. *O. stricta* 1 o, 4 o. *Linum monogynum* 1 o. *Melicope ternata* 1 S la, 3 o, 4 o. *Dysoxylum spectabile* 1 S o, 3 a-ld, 4 o. *Euphorbia glauca* 1 o. *Coriaria ruscifolia* 1 S o, 4 o (on slip with *Typha*). *Corynocarpus laevigatus* 1 S la, 3 a, 4 o. *Alectryon excelsum* 3 r. *Dodonaea viscosa* 4 o. *Pomaderris phlycaefolia* 2 f, 4 R o. *Entelea arborescens* 1 S o-f, 3 f, 4 o (sometimes groves of saplings). *Hoheria populnea* 3 o-f, 4 o. *Meliccytus ramiflorus* 1 S a, 3 a, 4 o. *Hymenanthera novae-zelandiae* va. 1 a-d, 2 o, 3 + (occasionally E). *Tetrapathaea tetrandra* 3 r. *Pimelea Urvilleana* 1 o, 2 o, 4 +. *Leptospermum scoparium* 2 o, 4 o-ld. *L. ericoides* 2 a, 4 d. *Metrosideros florida* 2 r. *M. diffusa* 3 R o, *M. excelsa* Sol. ex Gaertn. 1 a, 2 a-d, 3 o-ld, 4 o. *M. scandens* 2 o, 3 R o. *Myrtus bullata* 4 o. *Epilobium nummularifolium* 4 + (T, on slip with *Typha*). *E. junceum* 4 +. *Fuchsia excorticata* 3 o. *Haloragis erecta* 1 o, 2 o. *H. depressa* 3 f. *Myriophyllum* sp. 4 + (T, in pit). *Nothopanax arboreum* 2 o, 3 f, 4 o-la. *Meryta Sinclairii* 3 la (rarely above 100 m., on T, A, B, C, D). *Schefflera digitata* 3 o. *Pseudopanax Lessonii* 1 S f, 2 o, 3 o, 4 o. *Hydrocotyle elongata* 3 o, 4 la. *Apium prostratum* 1 a. *Caucalis daucoides*\* 1 + (one stunted plant seen). *Angelica rosaeifolia* 1 la, 2 o (2 m. tall on C). *Griselinia lucida* 2 f. *Leucopogon fasciculatus* 4 o. *L. Fraseri* 4 ld (on C, over small burnt areas). *Suttonia salicina* 4 + (one seen on T, girth 64.5 cm.). *S. australis* 1 S o, 2 o-f, 3 o, 4 la. *Samolus bullata* 1 o. *Anagallis arvensis*\* 1 o, 4 +. *Sideroxylon novo-zelandicum* 1 S la, 3 f-la (seedlings abundant in forest). *Olea apetala* 1 S o, 3 la, 4 r (la. on ridges, short-trunked, spreading, 4-5 m. tall). *Geniostoma ligustrifolium* 1 S o, 3 1 f, 4 f. *Erythraea centaurium*\* 2 o, 4 o. *Parsonsia heterophylla* 1 S o, 3 o, 4 o. *P. capsularis* 3 +. *Calystegia sepium* 1 S o. *C. tuguriorum* 1 S a. *C. soldanella* (on D, very lax). *Dichondra repens* 1 o-a, 3 o, 4 o. *Vitex lucens* 3 la, 4 o. *Solanum nigrum* 2 o, 3 o, 4 o. *S. aviculare* 1 o (white and blue-flowered forms, leaves pinnatifid). *Hebe Bollonsii* 1 S 1. *H. salicifolia* 4 la. *H. parviflora* 1 S o-a, 2 o, 3 o, 4 o-ld (up to 9 m. tall in forest). *Orobanche minor*\* (T, C, on *Apium*). *Rhabdanthus Solanderi* 3 a, 4 r (leaves 1.6 by 1 cm. to 9.5 by 8 cm.). *Myoporum laetum* 1 S r-o (prostrate and thick-leaved on C, D). *Plantago Raoulii* 1 +. *P. major*\* 1 o. *Coprosma macrocarpa* 1 f, 2 o, 3 o, 4 o. *C. grandifolia* 3 o, 4 f-ld. *C. lucida* 2 o, 4 o. *C. retusa* Hook. f. 1 a. *C. robusta* 1 S o, 2 o, 3 o, 4 o. *C. rhamnoides* 2 r, 4 la. *C. gracilis* A. Cunn. 4 +. *C. tenuicaulis*? (on T). *Alseuosmia* sp. 4 r. *Sicyos angulata* 1 S la. *Lobelia anceps* 1 f, 4 o. *Wahlenbergia gracilis* 1 o-f, 2 o. *Lagenophora pumila* 4 o. *Olearia furfuracea* 1 o, 4 o-f. *O. albida* 4 o. *Gnaphalium luteo-album* 4 R o. *G. japonicum* 2 o. *G. collinum* 4 R o. *G. purpureum*\* 4 +. *Helichrysum glomeratum* 1 +, 4 + (on A, B). *Bidens pilosa*\* 1 o, 2 la. *Erechtites scaberula* 4 o. *E. arguta* 4 o. *E. quadridentata* 4 f. *Brachyglottis repanda* 1 S o, 3 o, 4 la. *Senecio lautus* 1 a, 2 a. *S. Kirkii* 2 a, 4 o (broad-leaved form). *Picris hieracioides* 1 o, 2 la, 4 o-a. *Sonchus asper* 1 o. *S. oleraceus*\* 1 o, 2 o, 4 o. *Crepis capillaris*\* Wallv. 4 +. *Erigeron canadense*\* 2 o, 4 o. *Aster subulatus*\* 4 r. *Hypochaeris radicata*\* 1 o-f, 2 la, 4 o-a. *Carduus pycnocephalus*\* 2 la, 4 o. *Cnicus lanceolatus*\* 4 vr.

The 227 indigenous species include 46 pteridophyta (families 5, genera 23), 1 gymnosperm, 54 monocotyledons (families 9, genera 40), 126 dicotyledons (families 59, genera 92). The 36 introduced species are not abundant, and rarely penetrate unmodified areas. They include 12 grasses and 9 composites, while 28 have very light seeds.

*Phytolacca octandra* excepted, succulent-fruited weeds are conspicuously absent. Man's influence, apart from the introduction of *Salix* and a few weeds living for a time round camp-sites, has been greatest in recent years in the wanton burning of large areas.



# TARANGA OR HEN ISLAND



Fig. 1. Sketch showing position of Hen and Chickens Islands, from Chart No. 2543. *Taranga* = 1175 ac. (c. 476 hectares), A = 338 ac. (c. 136 h.), B = 168 ac. (68 h.), C = 49 ac. (c. 20 h), D = 7 ac. (c. 2.8 h.), E (not visited) = 77 ac. (c. 31 h.). Soundings in fathoms.

Fig. 2. Sketch map of *Taranga*, showing extent of modification. M = modified areas (*Leptospermum* usually dominant); F = coastal forest; K = *Agathis australis*; Y = groves of *Meryta Sinclairii*; X = *Xeronema Callistemon*.

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Fig. 1. View of topmost peaks (c. 400 m.) and coastal forest from western landing.

Fig. 2. *Agathis australis* on Taranga.

Fig. 3. Interior of *Beilschmiedia* forest on Taranga with typical floor-cover of *Asplenium lamprophyllum*. Light trunks are *B. tarairi* and dark ones *B. tarva*.